

Name: _____

Date: _____

● Light Waves Reading Passage (Version 2)

LIGHT WAVES

Light is electromagnetic energy carried by light waves. Light waves are also called **electromagnetic (EM) waves**. Light waves are created by oscillations of electric and magnetic fields. They are periodic transverse waves that travel at a constant speed and oscillate regularly.

What we often call light is actually visible light. In actuality, there are different types of light. We characterize types of light by wavelength; different types of light have different wavelengths. For example, visible light has a wavelength between 700 nm and 380 nm. Different colors of visible light have different wavelengths. Visible light is the only type that we can see.

Light waves, like all waves, carry energy. Light waves carry electromagnetic energy. Electromagnetic energy is also called electromagnetic radiation. The higher the frequency of the electromagnetic wave, the greater the electromagnetic energy or radiation carried by the wave. *Note: We use the term light, electromagnetic wave and electromagnetic radiation interchangeably to describe the same thing.*

Intensity of light is the brightness of light. Intensity of light depends on the amplitude of electromagnetic waves. The higher the amplitude, the greater the intensity of light.

Light travels at a speed of 300,000,000 m/s in a vacuum. *Nothing* in the universe moves faster than the speed of light. Light travels fastest in a vacuum and slightly decreases as the density of the medium through which it travels increases. The speed of light insignificantly changes when traveling through air. For this reason, we say the speed of light in dry air is 3.0×10^8 m/s.

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● Light Waves Answer Sheet (Version 2)

Questions

1. Describe light waves.

2. How does the energy of a light wave vary with frequency?

3. How does the amplitude of a light wave vary with amplitude?

4. How does the speed of light change as density of the medium through it travels increases?

5. Why is it a misconception to think of light purely as something we can see?

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● Sound vs. Light Reading Passage

SOUND VS. LIGHT

Sound and light waves are the most studied waves in science. There are important differences and similarities between the two kinds of waves.

Sound waves are longitudinal mechanical waves. Sound waves carry sound energy and produce sound, which can be heard. Sound waves travel through solid, liquid or gas but not a vacuum. A sound wave's speed increases as the density of the medium increases. In this way, sound waves travel fastest through a solid. The energy of a sound wave is related to amplitude; the higher the amplitude, the louder the sound and the more energy carried by the sound wave.

Light waves are transverse electromagnetic waves. Light waves carry light or electromagnetic energy and produce light. Some light, such as visible light, can be seen. Light waves travel through solid, liquid, gas and a vacuum. A light wave's speed increases as the density of the medium decreases. In this way, light waves travel fastest in a vacuum. Unlike sound waves, the energy of a light wave is determined by frequency; the higher the frequency of the wave, the more energy carried by the light wave.

Light waves travel nearly 900,000 times faster than sound waves in dry air. We observe the difference in speed of light and sound during a thunderstorm. When lightning is discharged from a cloud, it heats the air around it very rapidly. The sudden increase in temperature produces a rapid expansion of air, which creates the sound of thunder. Although lightning and thunder occur at the same time, thunder seems to come after lightning. This is because light travels faster than sound. Therefore, you see lightning before you hear thunder.

Questions

1. What are sound waves?
2. What are light waves?
3. Complete the table so to compare and contrast light and sound waves.
4. How would your observation of lightning and thunder be different if the speed of light and sound were the same?

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● Sound vs. Light Answer Sheet

Questions

1. What are sound waves?

2. What are light waves?

3. Complete the table so to compare and contrast light and sound waves

	Light waves	Sound waves
What energy does it carry?		
How is it observed?		
What can it travel through?		
How does its speed change?		
What determines its energy?		

4. Compare the relative speed of sound and light waves.

5. How would your observation of lightning and thunder be different if the speed of light and sound were the same?
